Name: Allen P. Nikora, M. S;   Michael R. Lyu, Ph. D. ;
                          William H. Farr, Ph. D.;   Tom M. Antczak

Position/Title: Ni kora: MTS

Affiliation: Software   Product   Assurance   Section,   JPL;
                          Bellcore;   Naval   Surface   Warfare   Center;
                          Science Data Systems Section, JPIJ

Address: Ni kora: Mail Stop 125-233, JPL
                Lyu :   Bell core;   445   South   Street;   Box
                                  1910; Morristown, NJ; 07692-1910
                Farr: Naval Surface Warfare Center; B-10;
                                  Dahlgren, VA; 22448
                Antczak: Mail Stop 525-3610, JPL

Phone Number: Ni kora: JPL Extension 49694

Fax Number: Ni kora: (818)393-1362

Gov't Agency/Lab The Subject Technology Was Developed By/For:
     U.S. Air Force Operational Test and Evaluation Center (AFOTEC)

Paper Title: CASRE - An Easy to Use Software Reliability
                Measurement Tool

Description:

     Many different software reliability models have been proposed
since the first ones were published in 1971.   These models have
been shown to be useful in monitoring reliability growth over a
wide range of software development projects. However, their use as
a management tool is not as widespread as it might be.   One problem
is that there is no way of identifying the model most applicable to
a development effort prior to test.   'I'his can be mitigated,
however, by executing several models at once and using statistical
methods to identify the model most likely to produce accurate
results.   Recent work has also shown that more accurate predictions
can be produced by combining the results of several models in a
linear fashion.

     Another major issue in software reliability measurement is the
ease-of-use of currently available tools.   Several tools are
currently available, but many of them are difficult for non-
specialists to use.   For instance,   the primary outputs of several
tools are in the form of model parameter values.   Without detailed
mathematical knowledge of the models, the results cannot be
interpreted.   Although software developers and managers may have a
general knowledge of failure rates and mean time to failure, there
will be many who are not familiar with the details of software
reliability models.   Because of this, many of the currently-
available tools will be of limited use to these individuals. For
those tools that graphically display modeling results, the plots

themselves may be of low resolution, or there may be only a few types of plots in the results are displayed. In modeling software reliability, it is **useful** to be able to see high resolution displays of failure rate curves, reliability growth curves, the cumulative number of failures, and various tests for goodness of fit. Displays such as these would allow managers to easily predict future failure behavior and see relationships to the time and effort required to achieve a required reliability.

Operating the tools may also be difficult. Many tools have command-line interfaces, and do not take advantage of high resolution displays and pointing devices that would allow the construction of menu-driven or direct-manipulation user interfaces. Command-line interfaces can make it more difficult for users to remember the specific steps required to accomplish a task, and also make it easier for operations to be performed out of sequence. A pull-down menu or direct-manipulation interface, on the other hand, can assist users by explicitly listing the available operations and enabling only those that are appropriate.

We are currently implementing a software reliability measurement tool, CASRE (Computer Aided Software Reliability Estimation) that addresses these ease-of-use issues. CASRE includes the reliability models suggested by a recent AIAA recommended practices document, and runs in a Microsoft Windows environment. The command interface is menu driven; selective enabling and disabling of menu options guides users through the selection of a set of failure data, execution of a model, and analysis of model results. Data used as input to the models is simultaneously displayed as text and as a high-resolution display that can be controlled to let users view the data in six ways. Model predictions and various goodness-of-fit tests may be superimposed on the plot of the raw data. In addition, **CASRE** lets users to define model combinations, store them as part of CASRE's configuration, and run them in the same way as any other model.

This type of tool would be particularly useful to software development organizations searching for ways to more effectively manage their resources. For many projects, software reliability measurement has been shown to be an effective way to predict required resources during the testing phases. Specifically, it can help managers answer the following questions:

1. When will the software be ready for release?
2. How much time and effort will testing require?
3. What will the impacts to users be if the desired reliability is not achieved?

Since CASRE has been designed with the non-specialist in mind, it should have wider acceptance among managers and developers than tools requiring detailed knowledge of the models.